

Normal Modes
by Walter F. Smith and Marian McKenzie 11-01
(original tune)

C G7 C F G7
When a complicated system moves in a simple way

F C Dm G7
We all shout, “Hallelujah! Everything is A-OK!”

(Am) F C Dm G G7
It’s a normal mode! A nor-mal- mode.

G7 C G7 C F G
Each mass has its own amplitude, each mass has its own phase

F C F G7 C
But on frequency they all agree. It’s- normal modes we praise!

C G7 C F G7
The simple-est example is a single SHO

F C Dm G7
No matter how you twang it, you know it’s sure to go

(Am) F Em Dm G G7
At omega naught, ome-ga- naught!

G7 C G7 C F C G
One mass has just one mode, you see, a mode with zero nodes,

F C F G7 C
And more generally, we can all agree, N masses have N modes.

C G7 C F G7
Add up the nodes plus one and get a number that’s the same

F C Dm G7
As the index of the normal mode, and here’s another name:

(Am) F C Dm G G7
Call ‘em standing waves! Stan-ding- waves!

C G7 C F C G
“Standing waves” and “normal modes” mean just the same- thing!

F C
Let us sing some hymns to these synonyms

F G7 C
while they’re bouncing in full swing!

C G7 C F G7
On misty summer mornings, when all the dew is bright,
 F C Dm G7
I- contemplate my normal modes with- visions of delight!
 (Am) F C Dm G G7
They're orthogonal! Ortho-go-nal!
 C G7 C F G
Multiplied, they integrate to zero, oh what bliss!
 F C F G7 C
It's the basis of what we all love, Fourier Analysis!

© 2001 Walter Fox Smith